

REMARKS

Restriction Requirement

The examiner maintained a restriction requirement between two groups. The claims in these two groups have been canceled and new claims 182-247 have been added. **Applicant hereby admits on the record that the new dependent claims drawn to a method “further comprising reacting one or more said first functional group and said fourth functional group with a carboxyl group or a reactive derivative of a carboxyl group comprising a polymerizable group” (*see, e.g.*, claim 237) are obvious over the independent claims to producing platform molecules. Applicant respectfully requests reconsideration and withdrawal of the restriction requirement with respect to all of the new pending claims.**

Housekeeping Amendments

Some of the new claims use “Markush” language in place of phrases which previously used the word “or” and “can be substituted.” Specifically the phrase “CH₂ independently can be substituted by oxygen, sulfur, or an ester group” has been changed to read “CH₂ independently is selected from the group consisting of CH₂ which is unsubstituted and CH₂ which is substituted by an element selected from the group consisting of oxygen, sulfur, and an ester group.” The foregoing is a correction to claim format only and does not narrow the claim.

Anticipation Rejections

The examiner rejected claims 1-26, 153-154, and 157-181 as anticipated under 35 U.S.C. § 102(e) by U.S. Patent No. 6,649,230 to Seiberle.

Response

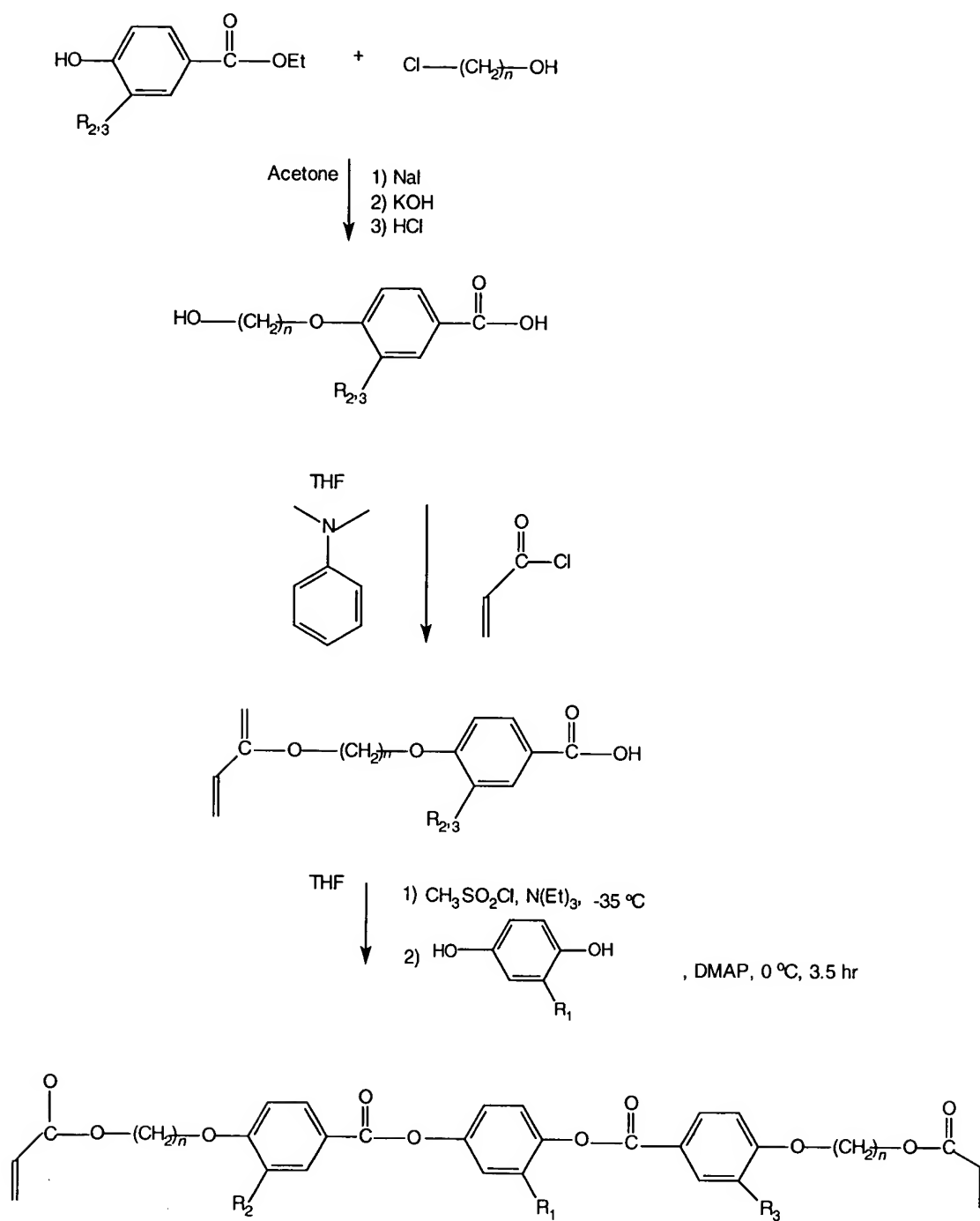
Claims 1-181 have been canceled and new claims 182-247 have been added.

Background

In order to assist the examiner in understanding the present application, and related applications, Applicant respectfully draws the examiner's attention to the specification, p. 8, ll. 23-p. 10, l. 15, which is reproduced below for the examiner's convenience.

New Synthetic Pathways to Make the Mesogens

In the past, polymerizable mesogens having the foregoing structure were synthesized by a multistep process ("Scheme 1"), as shown below:



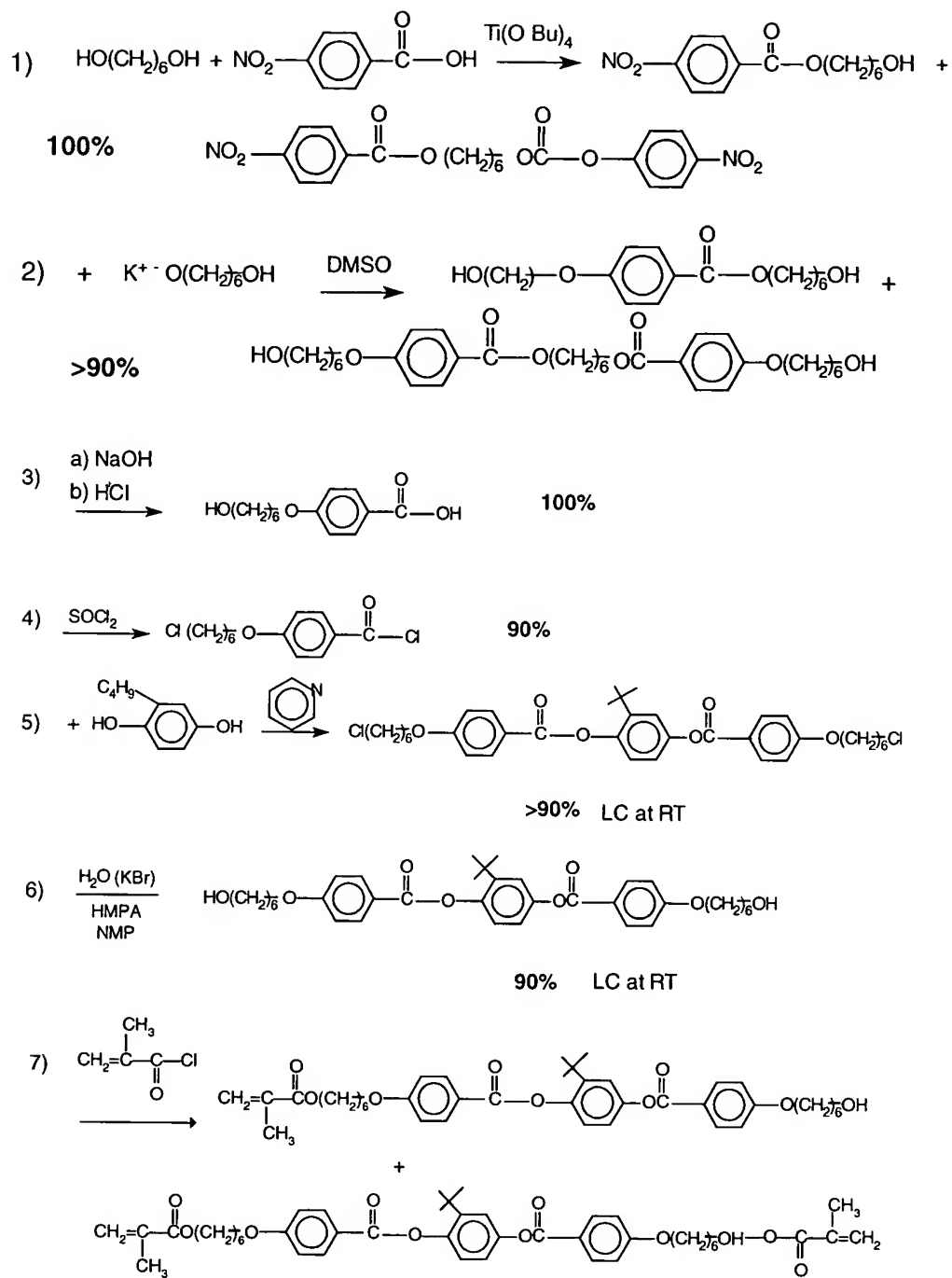
Scheme 1.

In Scheme 1, molecular ends containing the outer aromatic groups and the alkyl groups were produced first and then coupled to the central aromatic group by diaryl ester bonds. Specifically, the alkali phenoxide salt of p-hydroxybenzoic acid-ethyl ester nucleophile attacked the 6-hydroxy 1-chloro hexane with the aid of iodide catalyst to produce the 6-hydroxyhexyloxybenzoic acid (after hydrolysis of the ethyl ester) by a procedure that yielded at best 70% product. Although rather straightforward, the commercial potential of this synthesis has been limited by the use of the 6-hydroxy 1-chlorohexane. The reaction is run in acetone over several days and requires significant workup. The reaction also produces only about a 40% overall yield, at best, and requires column separation to separate monosubstituted from disubstituted material

The present application provides new synthetic pathways that use relatively low cost materials to synthesize a central aromatic component comprising end groups that are easily reacted with the desired polymerizable groups. The methods are qualitative, produce high yields, the products are easily purified (preferably by crystallization), and many of the products are more stable than bisalkenes, which must be stabilized against polymerization.

Emphasis added.

With this preface, Applicant respectfully requests the examiner to consider the following arguments with respect to the new synthetic pathways, which are reflected in the subject matter of the present claims. The new synthetic pathway is illustrated in Scheme 2, on page 12 of the application, which is also described at pages 13-16 of the application. Scheme 2 is reproduced below for the examiner's convenience:



Scheme 2.

Claims 182-194 and 244-246

The examiner has not pointed to a teaching in Seiberle of a method that produces platform molecules comprising terminal groups comprising either (a) hydroxyl groups (claim 203, and dependent claims), (b) amino groups, sulfhydryl groups, or halogen atoms, or (c)

comprising other than polymerizable groups, one or more of said terminal groups being selected from the group consisting of $\text{HO}-(\text{CH}_2)_n\text{-O-}$ groups, $\text{Cl}(\text{CH}_2)_n\text{-O-}$ groups, $\text{Br}(\text{CH}_2)_n\text{-O-}$ groups, $\text{I}(\text{CH}_2)_n\text{-O-}$, and reactive derivatives thereof, wherein n is from about 2 to about 12 and CH_2 independently is selected from the group consisting of CH_2 which is unsubstituted and CH_2 which is substituted by an element selected from the group consisting of oxygen, sulfur, and an ester group; provided that at least 2 carbon atoms separate said oxygen or said ester group.

Also, at least as Applicant reads Seiberle, the examiner has not pointed to a teaching or suggestion in Seiberle of the following limitation of claims 182 and 237 “forming a mixture comprising said first phenylene rings [A], said second phenylene rings [B], and said third phenylene rings [C].” (A+B+C).

Rather than teaching the claimed A+B+C, Seiberle appears to teach

$$A+B=1$$

$$\text{and } 1+C=2.$$

In other words, at least Example 1 of Seiberle describes a process of producing a first product (1) by forming a first mixture of (A) a first phenylene ring, and (B) a second phenylene ring. Then, the first product (1) is mixed with the third phenylene ring (C) to form a final product (2). The following is an attempt to annotate the foregoing argument.

- (1) Mixing a first phenylene ring with a second phenylene ring to produce a first reaction product:

| | |
|---|------------------------------|
| (A) "2,5-dihydroxybenzoic acid 11-(2-methylacryloyloxy ester" | Seiberle, col. 25, ll. 1-15. |
| + (B) "(E)4carboxylcinnamic acid methyl ester" | |
| = First Reaction Product: "(E)- 2-hydroxy-5-[4-(2-methoxycarbonylvinyl)benzoyloxy]benzoic acid 11-(2-methylacryloyloxy)undecyl ester" | |

- (2) Mixing the first reaction product with a third phenylene ring to produce a final product:

| | |
|---|-------------------------------|
| First Reaction Product: "(E)- 2-hydroxy-5-[4-(2-methoxycarbonylvinyl)benzoyloxy]benzoic acid 11-(2-methylacryloyloxy)undecyl ester" | Seiberle, col. 25, ll. 23-67. |
| + (C) "4-propylbenzoic acid" | |
| =Final product: "(E)-5-[4-(2-methoxycarbonylvinyl)benzoyloxy]-2-(4-propylbenzoyloxy)benzoic acid 11-(2-methylacryloyloxy)undecyl ester" | |

The examiner has not pointed to a teaching in Seiberle to produce the product by forming a mixture of all three components in a single mixture (A+B+C) to produce the final product. The examiner therefore has not pointed to a teaching or suggestion in Seiberle of every element of claim 182, claim 237, or claims depending therefrom.

The examiner did not issue an alternate obviousness rejection over Seiberle. In anticipation of any such rejection, Applicant submits the following. In order to establish a case of *prima facie* obviousness over Seiberle, the examiner must point to two things in the prior art, and not in the applicant's disclosure--(1) the suggestion of the invention, and (2) the expectation

of its success. *In re Vaeck*, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991). See also MPEP 2143.

The examiner has not met this burden.

The examiner has not pointed to a teaching or suggestion in Seiberle of the features discussed above. Nor has the examiner pointed to a teaching or suggestion in the **references themselves** that it would be desirable to make the modifications required to result in the claimed method. MPEP 2143.01; *In re Brouwer*, 37 U.S.P.Q.2d 1663, 1666 (Fed. Cir. 1995).

Applicant respectfully requests that claims 182-194 and 237-247 be allowed over Seiberle.

**Claims 182-185, claims 195-226, claims 228-230,
and claim 238 (and dependent claims)**

The examiner has not established a case of *prima facie* anticipation of claims 183-185, claims 195-226, claims 228-230, or claim 238 (and dependent claims) over Seiberle because the examiner has not pointed to a teaching in Seiberle to prepare the first and/or the second phenylene ring by

reacting 4-nitrobenzoic acid with a 1, n-dihydroxyalkane comprising an alkylene group having from about 2 to about 12 carbon atoms in the presence of an esterification catalyst under esterification conditions effective to produce a hydroxyalkyl ester of 4-nitrobenzoic acid;

treating the hydroxyalkyl ester of 4-nitrobenzoic acid under cleaving conditions effective to produce 4-(n-hydroxyalkoxy)benzoic acid, wherein n is the number of carbon atoms in said alkylene group;

providing said 4-(n-hydroxyalkoxy)benzoic acid as one or more of a phenylene ring selected from the group consisting of a first phenylene ring comprising a first carboxylic group and a second phenylene ring comprising a second carboxylic group.

According to Applicant's interpretation, the preparation of the monomers is described in Seiberle's Examples. In example 1, Seiberle's preparation of 4-carboxyl cinnamic acid methyl ester appears to roughly correspond to the preparation of one of the "first" or the "second

phenylene ring” Seiberle reacts “4-carboxybenzaldehyde” with “[(methoxycarbonyl) methyl]triphenyl phosphorane,” as shown at Seiberle col. 23, ll. 20-37. The “second phenylene ring” appears to correspond roughly to Seiberle’s “4-propylbenzoic acid”, the preparation of which is not described. Seiberle, col. 25, ll. 1-16 (emphasis added).

The examiner has not pointed to a teaching in Seiberle to

react[] 4-nitrobenzoic acid with a 1, n-dihydroxyalkane comprising an alkylene group having from about 2 to about 12 carbon atoms in the presence of an esterification catalyst under esterification conditions effective to produce a hydroxyalkyl ester of 4-nitrobenzoic acid;

treat[] the hydroxyalkyl ester of 4-nitrobenzoic acid under cleaving conditions effective to produce 4-(n-hydroxyalkoxy)benzoic acid, wherein n is the number of carbon atoms in said alkylene group;

provid[e] said 4-(n-hydroxyalkoxy)benzoic acid as one or more of a phenylene ring selected from the group consisting of a first phenylene ring comprising a first carboxylic group and a second phenylene ring comprising a second carboxylic group.

The examiner therefore has not pointed to a teaching of every limitation of claims 183-185, claims 195-226, claims 228-230, or claim 238 (and dependent claims) in Seiberle.

-Claim 227, and claims depending therefrom

Claim 227 does not include the foregoing limitations involving reaction with nitrobenzoic acid to produce phenylene rings. However, claims 227-236 do include the following limitation:

forming an elongation mixture comprising one or more additional phenylene rings comprising additional functional groups other than polymerizable groups at para-position(s) to additional carboxylic group(s) selected from the group consisting of carboxyl groups and reactive derivatives of carboxyl groups; and

exposing said elongation mixture to conditions effective to react said additional carboxylic group(s) with one or more functional group selected from the group consisting of said second functional group and said third functional group to produce elongated platform molecules comprising additional phenylene rings comprising said additional functional group(s) at a position para- to additional ester bond(s).

The examiner has not pointed to a teaching or suggestion of the foregoing limitations of

claims 227-236 in Seiberle.

-Rejection over Schadt

The examiner rejected claims 1-4, 9, 10, 12, 13, 15, 16, 18-26, 153, 154-57-160, 162, 166, 169-171, 173, 174, 177 and 178 anticipated by U.S. Patent No. 6,144,428 to Schadt (“Schadt”).

-Response

The examiner also has not established a case of *prima facie* anticipation of the pending claims over Schadt. The claims are directed to a method of making monomers. The examiner has not pointed to a teaching in Schadt of a method of making monomers. The examiner certainly has not pointed to a teaching of each and every method limitation of the claims in Schadt.

The examiner has not pointed to a teaching regarding how the monomers shown at the bottom of col. 4 of Schadt are made. The background of the invention in Schadt teaches as follows:

Anisotropic transparent or colored polymer network layers with the optical axis oriented in three dimensions, either uniformly or pre-set point by point, are of great importance in many branches of display technology, integrated optics, etc.

Substances having these properties in principle, that is certain cross-linkable liquid crystalline diacrylates and diepoxides, have been known for some years. These substances in monomer form (before cross-linking) can be oriented in cells by means of conventional orientation layers or under the action of external fields (such as magnetic or electric fields) in the LC phase and can be photo cross-linked in a second stage by conventional means (irradiation with non-polarized light) without losing the orientation impressed in the monomeric state.

Schadt, col. 1, ll. 16-30 (emphasis added). Applicant has not found a teaching in Schadt regarding how to make the monomers. Example 2 merely states: “[t]he following diacrylate components were used as cross-linkable LC monomers in the examples.” Schadt, col. 2, ll. 46-47.

The examiner has not pointed to a teaching or suggestion of each and every limitation of the pending method claims in Schadt, and has not established a case of *prima facie* obviousness of the claimed method over Schadt.

Although the examiner did not issue a rejection over Schadt based on obviousness, the examiner also has not established that the claims are *prima facie* obvious over Schadt. The examiner has not pointed to a teaching in Schadt or in another cited reference of: (1) the suggestion of the claimed method of making monomers, or (2) the expectation of its success. *In re Vaeck*, 20 U.S.P.Q.2d at 1442.

Applicant respectfully requests that the rejection over Schadt be withdrawn.

-Rejection over Joliffe

The examiner rejected claims 46-68, 71 and 73-87 as anticipated by U.S. Patent No. 6,117,920 to Jolliffe, et al. ("Jolliffe").

Response

The examiner has not established a case of *prima facie* anticipation over Jolliffe. Joliffe describes many different polymers. However, the only description of a **method** for making these polymers that Applicant has found in Joliffe is the following:

The compounds (1) and (2) are prepared in analogy to the methods described in WO 93122397 and DE 195 04 224.

See Joliffe, col. 23, ll. 43-44 and col. 25, l. 16-17. WO 93122397 and DE 195 04 224 appear to correspond to U.S. Patent No. 5,871,665 to Coates, et al. ("Coates").

Coates' examples appear to refer the reactions illustrated in Diagrams 1-11, which span columns 45-64. The examiner has not pointed to a teaching or suggestion of every method limitation of the pending claims in Joliffe or in Coates for the reasons given above with respect

to Seiberle.

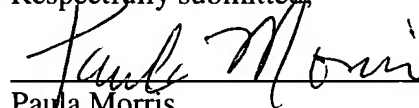
The examiner has not pointed to each and every limitation of the claimed method in Jolliffe, or in another cited reference, and has not established a case of *prima facie* anticipation of the claims over Jolliffe.

The examiner also has not established that the claims are *prima facie* obvious over Jolliffe. The examiner has not pointed to a teaching in Jolliffe or in another cited reference of: (1) the suggestion of the claimed method, or (2) the expectation of its success. *In re Vaeck*, 20 U.S.P.Q.2d at 1442. Nor has the examiner pointed to a teaching or suggestion in Jolliffe or another cited reference that it would be desirable to make the modifications that would be required to result in the claimed method. *In re Brouwer*, 37 U.S.P.Q.2d 1663, 1666 (Fed. Cir. 1995).

CONCLUSION

For the foregoing reasons, applicant respectfully requests entry of the amendments submitted herewith and consideration and allowance of the pending claims.

~~Respectfully submitted,~~

A handwritten signature in cursive script, appearing to read "Paula Morris", is written over a horizontal line.

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